4.0 Status of Individual Special Protection Areas

4.1 Clarksburg Master Plan Special Protection Area

The Clarksburg Area Master Plan, adopted in June of 1994, approved the creation of the first SPA. Based on the environmental analysis for the Clarksburg Master Plan, and guidance provided from the Maryland Department of the Environment and Maryland Department of Natural Resources, portions of Little Seneca Creek, Ten Mile Creek, Wildcat Branch, and Cabin Branch were included in the SPA (Figure 2) in order "to assure that identified sensitive environmental resources were protected to the greatest extent possible from development activities" (Approved and Adopted Clarksburg Master Plan, June 1994, page 206). "Achieving this rather delicate and imprecise balance was recognized to be a difficult goal but one which must be achieved if Clarksburg's outstanding environmental setting is to be preserved" (Approved and Adopted Clarksburg Master Plan, June 1994, page 18).

The Little Seneca portion of the SPA encompasses approximately 6100 acres of land. Little Seneca Creek in this location is designated by the state of Maryland as a Use IV-P stream (i.e. protection of put-and-take trout and public water supply). Table 3 below lists the State standards for Use IV-P streams.

The Ten Mile Creek subwatershed is approximately 3600 acres of land. The SPA includes all land in the subwatershed which is east of the Ten Mile Creek mainstem and north of West Old Baltimore Road. Ten Mile Creek is designated by the state of Maryland as a Use I-P stream (i.e. protection of water contact recreation, aquatic life and drinking water supply). Table 3 below lists the State standards for Use I-P streams. Historically, Ten Mile Creek was one of the last streams in Montgomery County to support Brook Trout.

Only two small portions of the Cabin Branch subwatershed are included in the SPA. These areas are identified as being outside projected 100' wide stream buffers and having a higher potential for groundwater contamination than the surrounding areas.

The inclusion of a small portion of the Wildcat Branch subwatershed is due to the potential for adverse impacts to the stream from anticipated development along Brink Road and the construction of Mid-County Highway. The Wildcat Branch portion of the SPA consists of any tributaries in the Clarksburg planning area that receive stormwater runoff from the Brink Road area and the future Mid-County Highway extension. The Wildcat Branch is designated by the state of Maryland as a Use Class III stream (protection of naturally reproducing trout populations). Table 3 below lists the State standards for Use III streams.

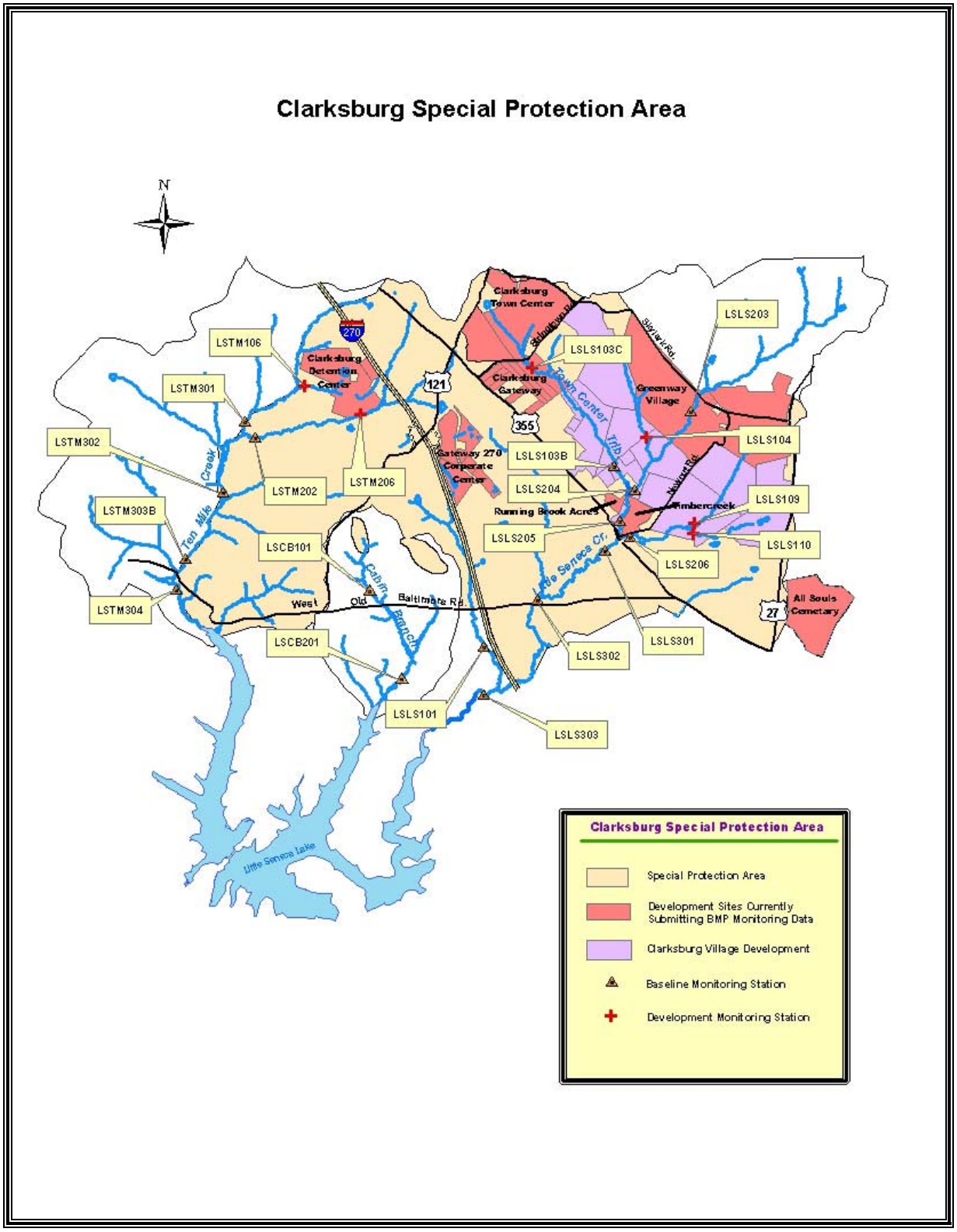


Figure 2. Clarksburg Special Protection Area

Table 3. Water Quality Standards for Maryland Streams

Parameter	Class I-P	Class III	Class IV-P
Maximum Total Fecal Coliforms (log mean per 100 mL)	200	200	200
Minimum Dissolved Oxygen (mg/L)	5	5	5
Minimum Daily Average Dissolved Oxygen (mg/L)	N/A	6	N/A
Maximum Temperature (Degrees Fahrenheit)	90^{o} or ambient (whichever is greater)	68^{o} or ambient (whichever is greater)	75^{o} or ambient (whichever is greater)
pH	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5
Maximum Turbidity (NTU)	150	150	150
Maxumum Monthly Average Turbidity (NTU)	50	50	50
Total Residual Chlorine	N/A	No Chlorine Permissible	N/A

4.1.1 Extension of Water and Sewer Service and Increased Density of Development

The 1994 Clarksburg Master Plan recommends the majority of the Clarksburg SPA for public water and sewer service. The Clarksburg area is starting the initial expansion of public water and sewer service recommended in the master plan, primarily in the Town Center District located between Clarksburg and Stringtown Roads northeast of Route 355. The County Council recently approved an amendment to the Water and Sewer Plan which grants approval for public water and sewer service throughout much of the Development Stages 2 and 3 areas (Future Sewer Service Areas A1 and A) east of I-270; the accompanying map (Figure 3) reflects these approvals.

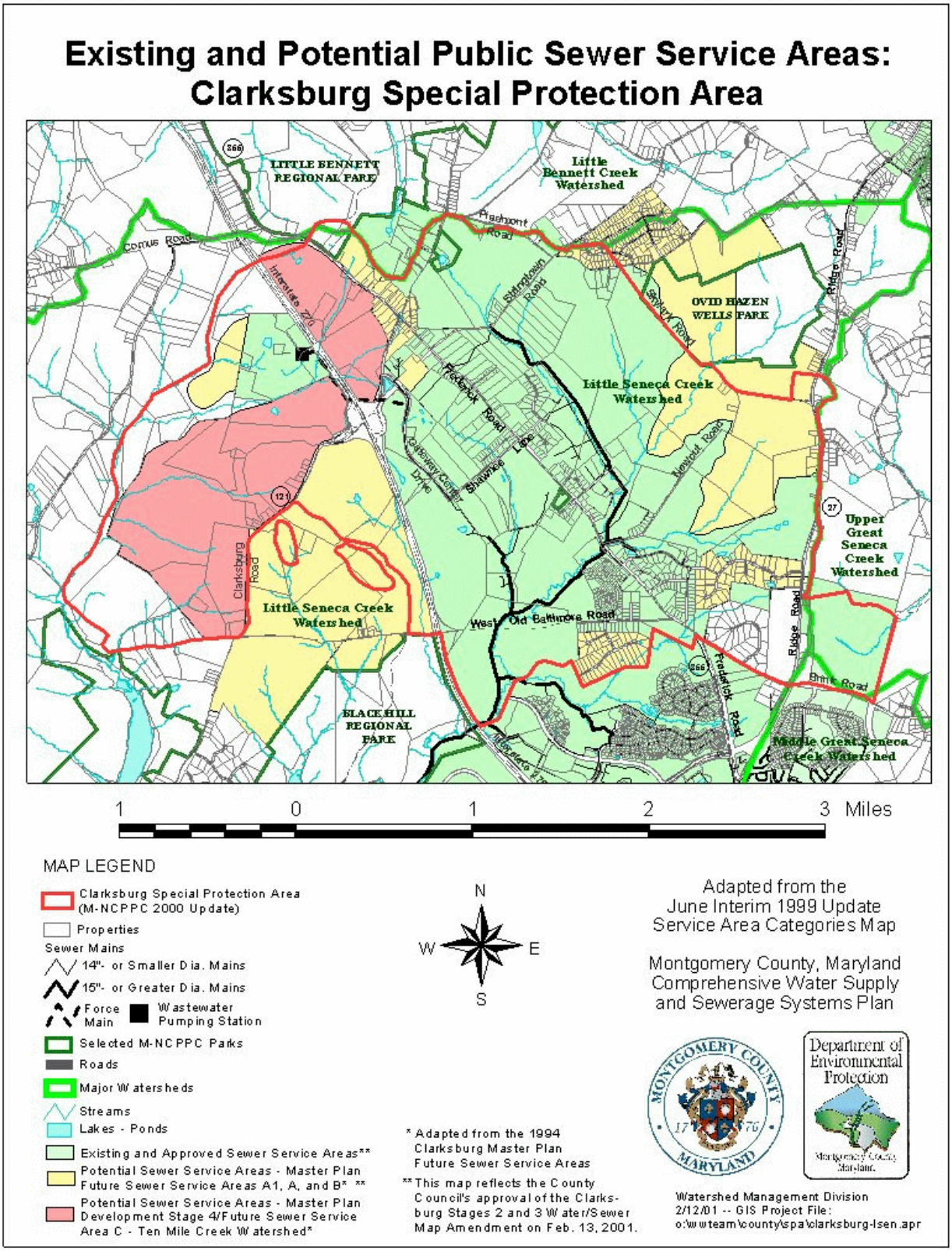


Figure 3. Clarksburg SPA Sewer Service Areas

Two major Development Stage 3 areas remain as potential sewer service areas: the entire area west of I-270, primarily in the Cabin Branch subwatershed (Future Sewer Service Area B), and the northeastern part of the area east of I-270 (as shown on the accompanying map). Public sewer approval of these areas will require inclusion in the WSSC capital improvements program (CIP) budget of the capital sewerage system projects (trunk mains, pumping stations, and force mains) needed to provide sewer service.

Another potential sewer service area within the SPA is Development Stage 4 (Future Sewer Service Area C) in the Ten Mile Creek subwatershed (shown in red on the map). Master plan staging triggers link development needing pubic water and sewer service in Stage 4 in part to the results of water quality monitoring for the earlier development stages. These requirements reflect the concern in the Clarksburg Master Plan for, "... the environmentally fragile nature of the streams in this area ..." The master plan requires DEP to conduct baseline monitoring in the Little Seneca Creek and Ten Mile Creek watersheds for at least three years. Baseline assessment in these watersheds began in 1994. The master plan also requires ongoing monitoring by DEP as development proceeds in the Newcut Road and Town Center (Stage 3) neighborhoods to evaluate the water quality best management practices (BMPs) for that development. DEP is to provide its evaluation of these BMPs in the Annual Report on the Water Quality Review Process which follows immediately after the release of 2,000 building permits for housing units in the Newcut Road and Town Center neighborhoods. This allows for 2,000 units to get under way east of I-270 to reinforce the Clarksburg town concept. DEP staff are currently working with M-NCPPC and DPS to better track the issuance of building permits in these neighborhoods. DEP staff estimate 2,000 units to be permitted in 2 to 5 years under current market conditions.

The County Council will then assess the results of DEP's evaluation, along with considering capital infrastructure needs for the Stage 4 area and voluntary water quality protection measures taken by local property owners. Following the assessment, the approved and adopted Clarksburg Master Plan (June 1994), stipulates that the County Council can choose from among the following actions:

- Proceed with Stage 4 development by granting Water and Sewer Plan amendments allowing public water and sewer service.
- Proceed with Stage 4 development, as above, but with additional measures, such as more stringent water quality requirements and further development staging, to protect the watershed.
- Defer action on development in Stage 4, pending further study or consideration, by deferring the Water and Sewer Plan amendments needed for public water and sewer service
- Consider other land use options for the watershed, which may or may not require public water and sewer service.

4.1.2 Status of Development in the Clarksburg Master Plan SPA as of June, 2002

As stated in the previous report, with the construction of the trunk sewer extension into the Clarksburg Town Center area, the Clarksburg SPA will be undergoing enormous change in the next few years. Phase I of the Clarksburg Town Center development has been under construction for over a year with Phase II construction permits pending final sediment control plan approval. The two largest proposed mixed-use subdivisions that have been mentioned in previous reports continue progressing through the development process; they are Greenway Village (formerly DiMaio Property, approximately 400 acres) and Clarksburg Village (approximately 730 acres). Greenway Village has submitted a Final Water Quality Plan (FWQP) for phase I and II of site development and likely will begin construction within the next year. Clarksburg Village is currently in the Site Plan preparation process and will likely submit a FWQP before December 2002.

Several other sites in this SPA have been aggressively pursuing development plans in the last year and are in varying phases of the development process. Some of the more notable are Martens Property (103 acres, Preliminary Water Quality Plan/PWQP approved), Linthicum Property Phase I (126 acres, PWQP under review), Clarksburg Gateway (56 acres, PWQP approved), Gateway Commons (45 acres, PWQP under review), Clarksburg Ridge (35 acres, FWQP approved) and Rocky Hill Middle School (23 acres, P/FWQP under review). These subdivisions will account for about 1700 acres of new development which will be a significant increase in density and impervious area. This will greatly challenge the ability to sustain existing stream conditions in this watershed. Adding to this challenge are master plan and planning decisions to increase densities by absorbing Transferred Development Rights (TDRs) on Clarksburg Village, Martens Property and Gateway Commons. These density increases in Clarksburg to address county goals of increased available housing and protecting agricultural resources will also add impervious area and reduce available area for buffers and redundant stormwater management facilities. These density increases in Clarksburg to address county goals of increased available housing and protecting agricultural resources will add impervious area to the developable parcel of land.

Table 4 lists development projects which are active in the Clarksburg SPA. The table covers the time period from 1995 to June 2002. Table 4 is intended to provide the reader with a general idea of the locations, types, intensity, and stage of review or development of land development projects. As shown in the table, construction is currently underway on several projects and nearing completion on several others in the watershed. Baseline and construction (temporary) BMP monitoring is currently being performed on several sites as noted in section 4.1.3. As these sites are finalized, monitoring of the permanent stormwater management BMPs will begin.

Table 4. Clarksburg SPA Development Projects (1995 to June 2002)

PROJECT NAME	SPA LOCATION	DEVELOPMENT SIZE, TYPE	STATUS
All Souls Catholic Cemetery – Germantown	Wildcat Branch	166 acres - RDT	Phase I under construction.
Catawba Manor	Clarksburg, Little Seneca Subwatershed	10.9 acres (4.5 in SPA) RMX-2,R-200	Final water quality plan approved. Sediment control permit pending
Cellular Phone Antenna Site Ferguson Farm	Clarksburg, Little Seneca Creek Subwatershed	0.6 acres - RDT Communication tower and access drive	Exempt from water quality plan requirements. Stormwater management provided. As-built approved 2/23/98. Construction complete
Clark Meadow, Phase I	Clarksburg, Little Seneca Subwatershed	37 acres, R-200	Subdivision plan approved before SPA designation. Construction complete. As-built under review.
Clark Meadow, Phase II	Clarksburg, Little Seneca Subwatershed.	1.0 acres, R-200.	Plan under review.
Clarksburg Detention Facility (Seneca Correctional Facility)	Clarksburg, Ten Mile Creek Subwatershed	34 acres	Under final stage of construction.
Clarksburg Bus and Maintenance Depot	Clarksburg, Little Seneca Creek	9.28 acres	Water quality inventory approved. Sediment control permit pending.
Clarksburg Gateway (Highlands of Clarksburg)	Clarksburg, Little Seneca Creek	56.4 acres, RMX-2 and R-200	Final water quality plan approved.

Table 4. (continued)

Clarksburg Heights	Clarksburg, Little Seneca Subwatershed	54 acres, R-200	Subdivision plan approved prior to SPA designation. Under construction.
Clarksburg Ridge (Funt Property)	Clarksburg, Little Seneca Creek	24 acres, Residential	Preliminary and final water quality plan approved.
Clarksburg Town Center -	Clarksburg, Little Seneca Subwatershed	269 acres, RMX-2, RDT	Phase I is under construction. Phase II sediment control permits are pending final approval.
Clarksburg Village (Newcut Village)	Clarksburg, Little Seneca Creek	700 acres, mixed use, TDR receiving area.	Revised preliminary water quality plan (added approximately 40 acres and revised the site layout) approved.
Egan Property (C.N. Sherwood Property)	Clarksburg, Ten Mile Creek Subwatershed	101.6 acres, R-200, Commercial Picnic / Catering Facility	Water quality inventory approved. Phase I sediment control permit issued.
Gateway Commons	Clarksburg, Little Seneca Creek	45.2 acres, R-200TDR	Preliminary water quality plan approved.
Gateway 270 (Phase I)	Clarksburg, Little Seneca Creek	24.5 acres, I-3, 3 lots	Construction.complete, as-built under review.
Gateway 270 (Lot 7)	Clarksburg, Little Seneca Creek	4.9 acres, I-3	Construction in final stage.
Gateway 270 West (Phase II)	Clarksburg, Little Seneca Creek	35.5 acres, I-3, 6 lots	Under construction.
Greenway Village (DiMaio Property)	Clarksburg, Little Seneca Creek	400+ acres, PD (Planned Development)	Preliminary water quality plan approved. Final water quality plan submitted for first two phases.
Greenridge Baptist Church	Clarksburg, Little Seneca Creek	8.2 acres	Pre-application meeting completed. Project on hold.

Table 4. (continued)

Highlands of Clarksburg (now part of Clarksburg Gateway)	Clarksburg, Little Seneca Subwatershed	16 acres, RMX-2 (high density)	Preliminary/Final water quality plan approved.
Kingsley Wilderness School	Clarksburg, Little Seneca Creek	5.5acres, Montgomery County Site 30	Final water quality plan approved. Sediment control permit pending.
Linthicum Property (Phase I)	Clarksburg, Little Seneca Creek	126 acres, R-200	Preliminary water quality plan approved.
Martens Property	Clarksburg, Little Seneca Creek	103.1 acres, R-200 TDR-4.	Preliminary water quality plan approved
Nanna Property (Phase I)	Clarksburg, Little Seneca Creek Subwatershed	4 acres, R-200	Subdivision plan predated SPA designation. Construction nearing completion.
Nanna Property (Phase II)	Clarksburg, Little Seneca Creek	12.1acres, R-200C, 24 lots proposed	Under construction.
Parkside	Clarksburg, Little Seneca Creek	10.9 acres, R-200 RMX-2	Preliminary water quality plan approved
Rocky Hill Middle School (New)	Clarksburg, Little Seneca Creek	23+ acres, School	Preliminary/Final water quality plan under review.
Running Brook Acres	Clarksburg, Little Seneca Creek	11.7 acres, R-200, 24 lots proposed (cluster)	Under construction.

4.1.3 Summary of BMP Monitoring in the Clarksburg SPA

Table 5 lists the nine sites turning in BMP monitoring data in 2001. The Greenway Village at Clarksburg, Highlands at Clarksburg, Timbercreek, Running Brook and All Saints Cemetery development projects have either just recently begun or have not yet begun construction. The data DEP has on these sites provides information on pre-construction conditions. In the future, this data will be compared to data collected during construction and post-construction periods. Presently, it serves to establish a baseline and aid in evaluation of local conditions.

Table 5. Clarksburg SPA BMP Monitoring

PROJECT NAME & CONSULTANT CONDUCTING THE MONITORING	REQUIRED BMP MONITORING	REQUIRED TIME FRAME FOR BMP MONITORING	DATA SUBMITTED THUS FAR
Clarksburg Detention Center / *Chester Engineers* ***(construction began 9/98)***	**3 groundwater wells** *Ammonia, Total Phosphorus, Total Nitrogen, Specific Conductance, Nitrate, pH, Ortho-Phosphorus* **1 rainfall logger** - *along with the flow logger* **1 flow logger (SWM pond discharge rate***)* **1 continuous temperature logger** **stormwater monitoring** **2 water quality stations to monitor sediment traps (inflow and outflow)**	**pre-development monitoring:** 6 months **during-construction monitoring:** until site is stabilized and sediment control ponds converted to stormwater management ponds **post-construction monitoring:** 3 years during construction monitoring is to include 6 storm events	**groundwater data:** 1/98 - 8/00 **rainfall data:** 1/98 -11/01 **flow data:** 1/98 - 11/01 **temperature data:** 1/98 - 9/01 6 storm events received
Clarksburg Town Center / *Biohabitats* ***(construction began 9/99)***	**1 continuous flow logger** **1 rainfall logger -** along with flow logger **3 continuous temperature logging stations** **4 surface water quality stations:** *VOC, Oil and Grease, Herbicides & Pesticides, NO2, NO3, TN, TP, TSS, Metals, pH, DO, Conductivity*	**pre-development monitoring:** 1 year **during-construction monitoring**: until all infrastructure is installed, site stabilized and 50% of lots developed **post-construction monitoring**: 5 years	**flow and rainfall data:** 4/97 - 3/98, 10/00 - 12/01 **temperature data:** 6/97 - 9/97, 9/00, 6//01 - 10/01 **surface water quality:** 5/97 & 6/97
Gateway 270 / *Rodgers Associates* ***construction underway***	**2 continuous temperature loggers**	Three summers following permit approval	**Temperature data:** 7/99-9/99, 6/00-9/00, 6/01-9/01

Table 5. (continued)

Gateway 270 West / *Rodgers Associates* (c***onstruction underway)***	**water quality monitoring at stormwater pond:** Cadmium, Copper, Lead, Zinc, Kjeldahl Nitrogen, Nitrate Nitrogen, Ammonia Nitrogen, and Ortho-Phosphate	**pre-development monitoring:** 3 storm samples **during-construction monitoring**: none **post-construction monitoring**: 3 storms per year for three years	**water quality data:** three storms 7/00
Running Brook Acres ***(construction began during fall of 2001)***	**Embeddedness** **stormwater monitoring of 1 sediment trap** (TSS inflow and outflow) **Chemical and nutrient monitoring of linked BMP**	**pre-development monitoring:** 3 months **during-construction monitoring:** until site is stabilized and sediment control ponds converted to stormwater management ponds **post-construction monitoring:** 3 years	**Embeddedness:** 9/01-11/01
Greenway Village at Clarksburg (previously known as DiMaio Property) / *ESA*	**7 Groundwater wells** **3 instantaneous flows** **1 Continuous flow logger** **3 Cross sections** **3 Embeddedness stations** **2 Temperature loggers** **Stormwater monitoring of 1 sediment trap** (TSS inflow and outflow) **Western trib/BMP** (NO2, NO3, TKN, Ortho-P, total P, Cu, Cd, Pb, Zn, TSS)	**pre-development monitoring:** 1 year **during-construction monitoring**: until site is stabilized and sediment control ponds converted to stormwater management ponds **post-construction monitoring:** 5 years	**Cross-sections:** 12/01 **Groundwater Wells:** 11/01 – 4/02

Table 5. (continued)

Highlands at Clarksburg / *Macris, Hendricks and Glascock*	**2 Temperature loggers** **Stormwater TSS at sediment pond** **Photos of outfall** **Embeddedness** **Water chemistry at one linked BMP** (NO2, NO3,TKN, Ortho P, Total , TSS, Cd, PB, Zn, Cu) **5 groundwater Wells**	**pre-development monitoring:** 1 year **during-construction monitoring**: until site is stabilized and sediment control ponds converted to stormwater management ponds **post-construction monitoring**: 3 years, 5 years for wells	**Temperatures**: 6/01-9-01 **Wells**: 11/00-11/01
Timbercreek (previously known as Nanna property) / GTA ***(construction began10/01)***	**2 Temperature loggers** **2 Groundwater wells**	**pre-development monitoring:** 1 year **during-construction monitoring**: until site is stabilized and sediment control ponds converted to stormwater management ponds **post-construction monitoring:** 3 years	**Temperatures**: 6/01-9/01 **Wells:** 4/01 – 11/01
All Souls Cemetery / *Macris, Hendricks and Glascock* ***(construction began during fall 0f 2001)***	**1 Temperature logger** **2 stream channel cross sections**	**Pre-development monitoring:** 1 year **during-construction monitoring**: until site is stabilized and sediment control ponds converted to stormwater management ponds **post-construction monitoring:** 3 years	**Temperature:** 6/01 – 9/01 **Cross Sections:** 5/01

Clarksburg Detention Center (during-construction)

DEP has received rainfall and flow data from the Clarksburg Detention Center but it needs further analysis before it can presented here. The consultant has also failed to submit data on groundwater levels for 2001. The consultant providing the data has been asked to look into inconsistencies in the material and report back to DEP. The information will be included in next year's annual report. Temperature data from the site only reflects water temperatures when the pond is flowing. At other times the instrument is recording air temperatures. Therefore, the temperature data cannot be analyzed without reliable flow data. Temperature data will be presented along with the flow data from the project when available.

Clarksburg Town Center (during-construction)1

One year of pre-construction data was collected on this project between March of 1997 and March of 1998. Fourteen months of data have been collected since construction began in fall of 2000. During the past year of monitoring, development has included the installation of the sanitary sewer infrastructure and the preparations for the first phase of development along Stringtown Road and Piedmont Road at their intersection. These preparations have included the construction of stormwater management facilities, curbs and gutters, and grading for the building pads.

During the course of the first year of construction, the stream still exhibits typical behavior of a headwater stream, similar to pre-construction conditions. With regards to flow, the stream has short lag time responses to the beginning of storm events, peak rainfall intensities, and the termination of storm events. Lowest average monthly flows during the first year of during-construction monitoring were recorded in the spring and the highest monthly average flows were recorded during the late autumn and winter months. This differs slightly from pre-construction conditions where the lowest average monthly flows were recorded during the summer months and the highest monthly average flows were recorded during the winter months. This discrepancy is most likely due to precipitation trends. The summer of 1997, during the pre-construction monitoring, was extremely dry and hot. During that summer, both of the tributaries became dry several times. During construction monitoring in 2001, the summer was cooler than normal (July 2001 was the third coolest in 130 years of record and was cooler than June – only the 6th time this has occurred on record) with June, July, and August having normal precipitation totals. Lowest average flows were recorded during the spring, as opposed to the summer during the pre-construction monitoring, because February, March, April, and the first half of May were dry which provided lower average flows than the summer months. Highest average flows were recorded during the late-autumn and winter months, similar to pre-construction conditions, as the water table was recharged because of a decrease in the potential evapotranspiration and a cessation of water uptake by plants, due to dormancy, in addition to a higher soil moisture content.

The development activities of Clarksburg Town Center have not yet had any significant observable impact on stream flow or temperature. At the moment, it is uncertain whether the large sediment basin constructed has caused any long term flow attenuation and/or groundwater recharge. Perhaps future data will provide some insight when compared to baseline conditions. Overall, average monthly flows were higher for the first year of during-construction monitoring as compared to the pre-construction monitoring, indicating that baseflow is being maintained (one of the primary goals of the Final Water Quality Plan). Also, the peak flow recorded during the pre-construction monitoring was 140 cfs and the peak flow recorded during the first year of during-construction monitoring was 138 cfs. Thus, it does not appear that a significant increase in peak flows as a direct result of more runoff has occurred either. It should be noted again that

1 This section consists of excerpts from the January 2002 Clarksburg Town Center During-Construction Water Quality and Quantity Monitoring Report, prepared by Biohabitats Inc. and Versar Inc.

the year of pre-construction monitoring was recorded as a dry year on record and is difficult to use in comparisons. As development activities increase and more impervious surfaces are added to the watershed, there will be a better understanding if any flow or temperature impacts are occurring due to the Clarksburg Town Center project.

Monitoring of stream water chemistry is also being done for the Clarksburg Town Center project. Baseflow monitoring consisted of instream water quality measurements (temperature, pH, dissolved oxygen, specific conductance) and grab sampling of water for chemical analysis. Monitoring was carried out according to NPDES guidelines (*e.g.,* no rainfall for 24 hours prior to monitoring) and samples were collected and transported according to EPA guidelines. Results of baseflow monitoring are presented in Table 6. Results of storm flow monitoring are presented in Table 7. The sites were identified as follows: Site 1 is located below the confluence of the three tributaries and just north of Stringtown Rd.; Site 2 is on the western tributary; Site 3 is on the northern tributary; Site 4 is on the eastern tributary. During baseflow monitoring, the dissolved oxygen sensor developed a calibration problem. Additionally, the 4-Liter glass bottle containing the water sample from Site 3 shattered during transit to the analytical laboratory. A second set of water quality measurements as well as a resampling of Site 3 were carried out on May 9, 2001.

The storm event monitoring took place during a late fall coastal storm that delivered 0.53" of rainfall within the watershed. Versar personnel recorded *in situ* water quality measurements and performed initial grab sampling for the “first-flush” total petroleum hydrocarbons parameter approximately 1 hour into storm runoff. Grab sampling for VOCs and all other chemical parameters was performed at 20-minute intervals beginning approximately 1 hour into the storm until 6 discrete samples were obtained at each site. Spot checks of stream velocity were measured at the time of discrete sample collection in order to weight the composite sample according to estimated stream discharge. The discrete grab samples were transported to Versar according to EPA protocols and composited; the composites in turn were delivered to the analytical laboratory (VOC discrete samples were composited by the analytical laboratory).

Baseflow Water Chemistry

Baseflow water quality measurements (Table 6) generally were similar to those observed in 1997, however the north tributary (Site 3) showed a 35% higher conductivity measurement. Observed pH was slightly higher in 2001 for all tributaries. The west tributary (Site 2) showed the highest specific conductance values for both the 1997 and 2001 baseflows.

Nutrient concentrations differed slightly from levels observed in 1997. Total Kjeldahl Nitrogen was non-detectible in 2001 (< 0.5 mg/L), but showed values above detection limits (detection limit = 0.1 mg/L) in 1997. Total phosphorus was detectible in 2001 (detection limit = 0.01 mg/L), but was not so in 1997 (detection limit = 0.10). Nitrate was reduced by 21% to 37% in 2001.

Varying amounts of zinc, nickel, and copper were found in several baseflow samples, whereas

only lead and zinc were found in 1997. Zinc concentrations were reduced from 1997, but copper was present in 2001 in all sites during baseflow. At Site 3, the northern tributary, the copper concentration (0.023 mg/L) was higher than the MDE acute freshwater toxicity criterion of 0.013 mg/L (Code of Maryland Regulations, 2001). Copper concentrations found at Site 1, below the confluence of all three tributaries, and Site 4, the eastern tributary, were higher than the MDE chronic freshwater toxicity criterion. The sources of the copper may be from pipe corrosion, auto brake linings, and electroplating wastes (Bahr, 1997) and may stem from the increased construction activity upstream of the sampling sites.

Other parameters, such as total suspended solids and organics, were comparable to levels observed in 1997 (or not found at all). DEP has analyzed stream samples from the Colesville Depot from 1996 through 2000. Water chemistry values from the Town Center do not show extreme departures from mean values obtained from the Colesville Depot.

Stormwater Chemistry

Stormwater chemistry results in 2001 were generally comparable to, or slightly better than baseflow, possibly due to the dilution of groundwater contributions of pollutants found during baseflow. Concentrations of nitrate, total phosphorus, zinc, and copper were lower (or reduced to non-detectible concentrations) at all sampling sites during the storm event. Ortho-phosphorus, a component of agricultural fertilizer, increased during the storm event. Nitrate tends to be highly mobile and is frequently found to be lower in concentration during storm events (Frederick County Division of Public Works, 2001). Ortho-phosphorus binds to organic matter and its presence in runoff contributed to levels found at all four sampling sites (0.01 mg/L to 0.04 mg/L).

Water quality parameters measured during the storm event were comparable to baseflow monitoring earlier in the year; the major change was in water temperature due to the time of the year that sampling took place. Stormflow dissolved oxygen improved in December 2001 as compared to June 1997 and is probably the result of lower water temperatures and relatively wetter weather conditions than immediately prior to the 1997 storm event.

Total suspended solids concentrations during the 2001 storm were an order of magnitude (or more) lower than in 1997 due to the type of storm monitored. The 1997 storm event was probably a cold frontal passage with most rainfall occurring over a short time, whereas the 2001 event was of a lower intensity and longer duration. Total phosphorus was non-detectible for all sites during the 1997 storm event, but ranged from 0.02 mg/L to 0.06 mg/L in 2001. Total Kjeldahl nitrogen, nitrite, and biochemical oxygen demand levels were found for most sites in 1997, but were much lower or not detected in 2001. Organic pollutants were non-detectible in 2001 as in 1997. Trace amounts of copper, lead, chromium, and zinc were found in 1997, but nickel, copper, and lead were found in 2001. Storm samples have also been analyzed for the Colesville Depot from 1996 until 2000. The results for the two storms at the Town Center do not show extreme departures from mean values obtained from the Colesville Depot.

Table 6. Water quality results from May 2, 2001 baseflow monitoring.

Parameters	**Site 1** (confluence)	**Site 2** (west trib.)	**Site 3** (north trib.)[2]	**Site 4** (east trib.)	**Units**
Instream Water Quality Measurements					
Water Temperature (5/2/01)	20.1	19.9	19.6	18.0	C
Water Temperature (5/9/01)[1]	18.7	17.6	17.2	15.0	C
pH (5/2/01)	7.0	7.5	7.6	7.4	
pH (5/9/01)	7.2	7.4	7.5	7.4	
Dissolved Oxygen (5/9/01)	8.6	8.5	8.8	8.5	(mg/L)
Specific Cond. (5/2/01)	0.187	0.311	0.227	0.110	(ms/cm)
Specific Cond. (5/9/01)	0.180	0.320	0.196	0.113	(ms/cm)
Chemical Parameters					
Alkalinity	24	14	40	13	(mg/L)
BOD (5-day)	<1	<1	<1	<1	(mg/L)
Hardness	52	57	48	44	(mg/L)
Nitrate	3.2	4.1	1.9	5.5	(mg/L)
Nitrite	<0.02	<0.02	<0.02	<0.02	(mg/L)
Total Kjeldahl Nitrogen	<0.5	<0.5	<0.5	<0.5	(mg/L)
Total Phosphorus	0.07	0.05	0.09	0.08	(mg/L)
Ortho-phosphorus	<0.01	<0.01	<0.01	<0.01	(mg/L)
Total Suspended Solids	7	15	6	13	(mg/L)
Cadmium	<0.0005	<0.0005	<0.0005	<0.0005	(mg/L)
Zinc	0.03	0.01	<0.01	0.02	(mg/L)

Table 6. (continued)

Parameters	**Site 1** (confluence)	**Site 2** (west trib.)	**Site 3** (north trib.)[2]	**Site 4** (east trib.)	**Units**
Lead	<0.002	<0.002	<0.002	<0.002	(mg/L)
Copper	0.011	0.008	0.023	0.009	(mg/L)
Chromium	<0.005	<0.005	<0.005	<0.005	(mg/L)
Nickel	0.02	<0.02	<0.02	<0.02	(mg/L)
Mercury	<0.0005	<0.0005	<0.0005	<0.0005	(mg/L)
TPH	<2	2	<2	2	(mg/L)
VOCs	ND[3]	ND	ND	ND	(µg/L)
Herbicides	ND	ND	ND	ND	(µg/L)
Pesticides/PCBs	ND	ND	ND	ND	(µg/L)

Notes:

1. Instream WQ measurements were repeated on May 9 due to spurious dissolved oxygen readings.
2. Site 3 chemical parameters (except TPH) resampled on May 9 due to breakage of sample container used on May 2.
3. ND = below detection limits.

Table 7. Water quality results from December 8, 2001 storm event monitoring.

Parameters	**Site 1** (confluence)	**Site 2** (west trib.)	**Site 3** (north trib.)	**Site 4** (east trib.)	**Units**
Instream Water Quality Measurements					
Water Temperature	8.3	8.0	7.5	8.3	C
pH	6.6	6.4	6.7	6.8	
Dissolved Oxygen	9.9	6.9	8.4	9.4	(mg/L)
Specific Conductivity	0.166	0.374	0.197	0.126	(ms/cm)
Chemical Parameters					
Alkalinity	22	18	28	16	(mg/L)
BOD (5-day)	<2	<2	<2	3	(mg/L)
Hardness	46	65	52	44	(mg/L)
Nitrate	2.4	1.7	1.1	3.4	(mg/L)
Nitrite	<0.02	<0.02	<0.02	<0.02	(mg/L)
Total Kjeldahl	<0.5	<0.5	<0.5	<0.5	(mg/L)
Total Phosphorus	0.03	0.06	0.02	0.02	(mg/L)
Ortho-phosphorus	0.02	0.01	0.02	0.04[4]	(mg/L)
Total Suspended	3	3	2	3	(mg/L)
Cadmium	<0.0005	<0.0005	<0.0005	<0.0005	(mg/L)
Zinc	<0.01	<0.01	<0.01	<0.01	(mg/L)
Lead	<0.002	<0.002	0.002	<0.002	(mg/L)
Copper	<0.002	0.003	<0.002	<0.002	(mg/L)
Chromium	<0.005	<0.005	<0.005	<0.005	(mg/L)
Nickel	<0.02	0.02	<0.02	<0.02	(mg/L)
Mercury	<0.0005	<0.0005	<0.0005	<0.0005	(mg/L)
TPH	<2	<2	<2	<2	(mg/L)
VOCs	ND	ND	ND	ND	(µg/L)
Herbicides	ND	ND	ND	ND	(µg/L)
Pesticides/PCBs	ND	ND	ND	ND	(µg/L)

Notes:

4. Orthophosphorus cannot exceed total phosphorus; the result is due to analytical variance.

Gateway 270 project

This project is a 64.9 acre industrial development zoned I-3. It is bounded by Clarksburg Road, Shawnee Lane and the Comsat complex. It consists of ten lots with industrial space, parking and associated infrastructure. Stormwater will be redundantly treated by sand filters and wet ponds to provide quantity control for the 2-year storm and quality treatment for the first inch of runoff. A small bioretention cell will provide pre-treatment for stormwater on a portion of the project. Table 8 contains chemical monitoring results of stormwater runoff from the site. These results are similar to results obtained from other outfalls in the county. Post-construction data is being collected in 2002 that will be compared to this pre-construction data.

Table 8. Pre-construction storm monitoring results from Gateway West

Parameters	STORM 1 7/10/2000 (mg/L)	STORM 2 7/18/2000 (mg/L)	STORM 3 7/31/2000 (mg/L)
Cadmium	0.010	0.010	0.010
Copper	0.025	0.025	0.025
Lead	0.100	0.100	0.100
Zinc	0.020	0.020	0.020
Kjeldahl Nitrogen	2.000	2.000	10.000
Nitrite Nitrogen	0.050	0.050	0.050
Nitrate Nitrogen	0.150	0.150	0.360
Ammonia Nitrogen	1.000	1.000	1.000
Ortho-Phosphate as P	0.020	0.023	0.350

The Gateway 270 project was also required to collect temperatures below pond outfalls. Some representative temperature data from pond 2, during 1999 and 2001, is graphed in figures 4 and 5. The graphs show that water temperatures are strongly influenced by air temperatures. The pattern does not seem to have changed over the life of the project. As these are small stormwater ponds this result is to be expected. DEP expects the project to complete the last of their required temperature monitoring in 2002 and produce a report that will summarize their findings.

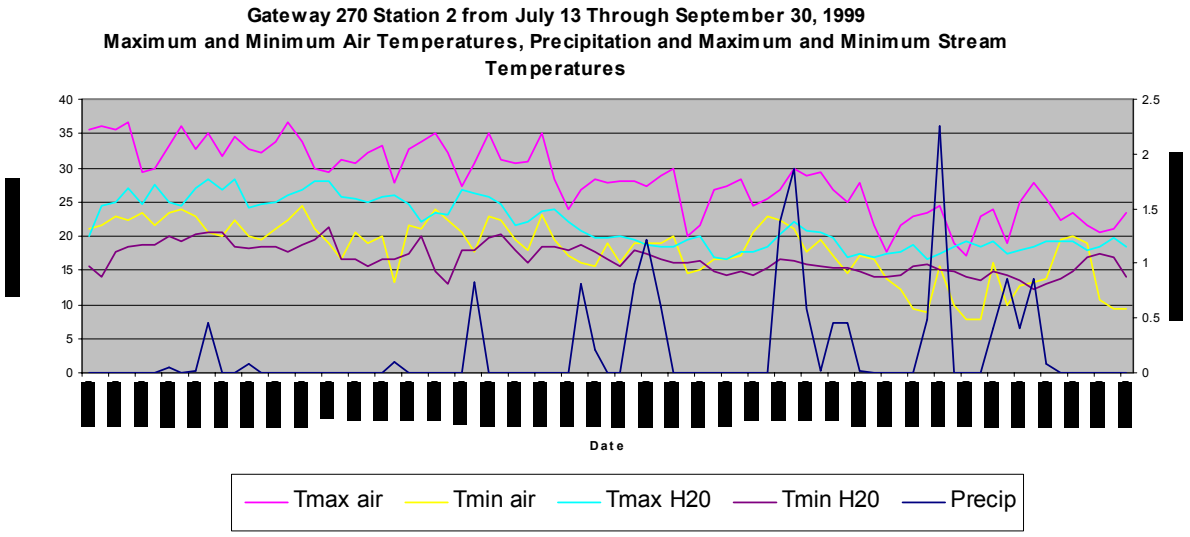


Figure 4. 1999 Gateway 270 Pond 2 Temperatures and Precipitation

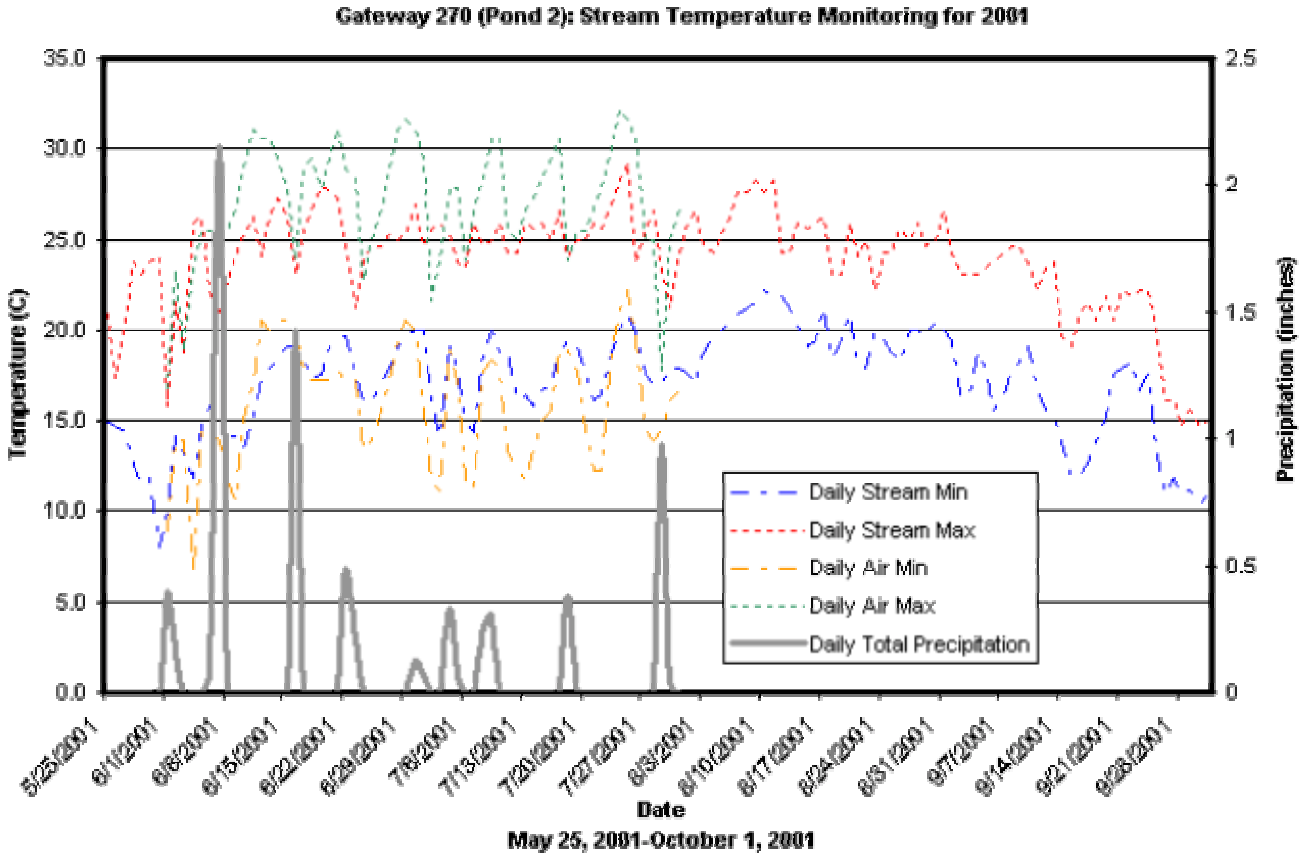


Figure 5. 2001 Gateway 270 Pond 2 Temperatures and Precipitation

Running Brook Acres (Pre-construction)

The site (R-200 zoned) consists of 11.75 acres and is located south of Running Brook Road and East of Route 355. Development of the site includes 20 single-family lots and associated infrastructure. Stormwater management for the site includes the following: quantity control provided via a dry pond sized to control the one year storm event with a pre-developed release rate. Quality control to treat the first one-inch of runoff from the impervious area is provided via a treatment train that consists of vegetated conveyance swales which outfall to a forebay/bioretention cell, and then drains to an infiltration cell. Construction on the site began during late fall / early winter of 2001.

All BMP monitoring requirements for the site are summarized in table 5. Pre-construction BMP monitoring requirements include embeddedness readings from a point in Little Seneca Creek downstream of the SWM/sediment control facility outfall. This monitoring was completed during the period of 9/01 – 11/01 and the results were submitted to DEP. Only three months of data were collected because the developer began construction soon after receiving approval from the planning board. Notable in this information is the observation of dense algal deposits in the stream near the Running Brook property. Similar algal growth was observed in Piney Branch before it experienced a decline in the benthic macroinvertebrate community.

Greenway Village at Clarksburg (Pre-construction)

This site is located south-west of Skylark road and consists of 374 acres. Currently the dominant land use on the site is agriculture (crops) with small patches of woodlands. When developed the site will contain mixed residential and commercial land uses. BMP monitoring requirements are summarized in table 5. Seven ground water wells were installed throughout the site during the period of 11/01 – 1/02 to study BMP effectiveness in mitigated development impact on hydrology. Because of the extremely dry weather experienced throughout the region, four of the wells have been dry since they were installed. All of the dry wells are located on high elevation points and are drilled to depths of 30, 25 and two at 45 feet.

Stream channel cross sections were surveyed in December of 2001. Results have been submitted to DEP and will be used for comparison against future measurements.

The continuous stream flow logger was installed in December of 2001. To date, no results have been submitted to DEP.

Highlands at Clarksburg (Pre-construction)

An example of pre-construction data DEP has received is the groundwater level monitoring from the Highlands at Clarksburg project. The site consists of 56 acres located at the southeast corner of the intersection of Stringtown Road and MD Route 355. The proposed development is zoned RMX-2/R-200 and will consist of commercial and office uses along with single family and

townhouse residential lots. Five wells (Table 9) are distributed over the site to provide information on groundwater elevations. Wells GW-1 and GW-2 are on upland areas of the site. Wells GW-3, Gw-4 and GW-5 are in the stream buffer area. Data received show that groundwater levels at the site have been very stable through the year of pre-construction monitoring. Future monitoring will show whether the groundwater at the site maintains these levels during and after construction.

Table 9. Highlands at Clarksburg Monitoring Wells

Well	Surface Elevation	Depth
GW-1	633.5	28.5
GW-2	616.9	24.4
GW-3	574.9	24.9
GW-4	570.5	25.9
GW-5	561.3	15.6

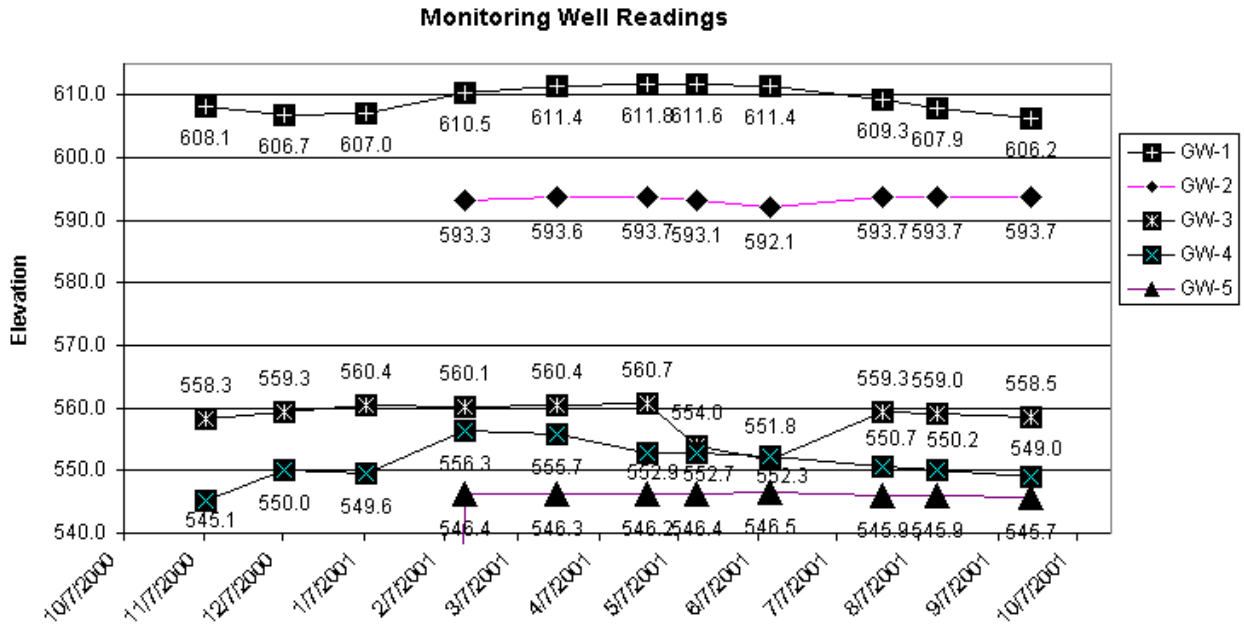


Figure 6. Highlands at Clarksburg Groundwater Elevations

Timbercreek (pre-construction)

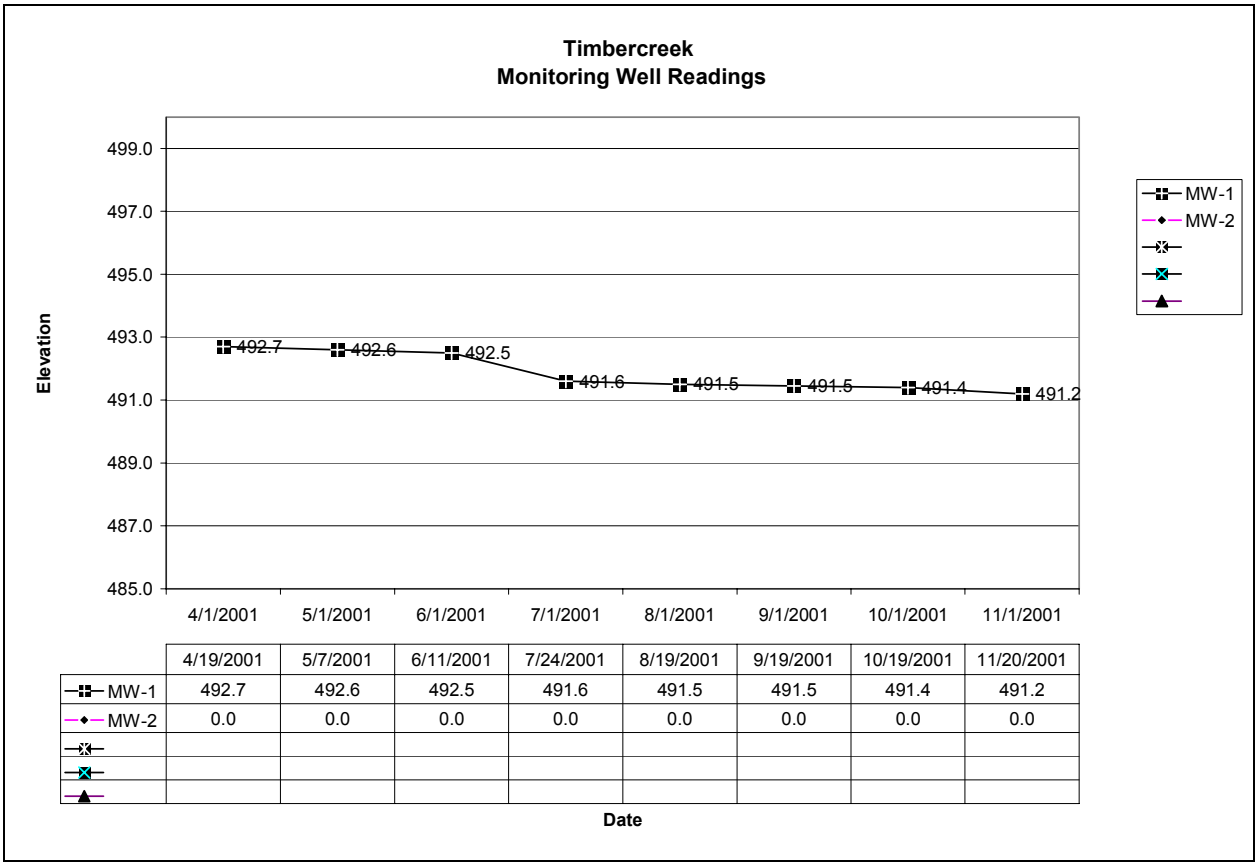
The site (zoned R-200) consists of 12.2 acres and is located on the north side of Newcut Road near the Rt. 355 / Newcut Road intersection. Development of the site includes 24 single-family lots. Water quantity control on the site will be provided via a dry pond that will provide control for the one year storm event with a pre-developed release rate. Quality control will be provided via a treatment train, which consists of vegetated conveyance swales and modified dry swales

(infiltration swales) that outfall to a surface sandfilter. The sandfilter is sized to treat one-inch of run-off over the impervious area.

BMP monitoring requirements for the site are summarized in table 5. Pre-construction BMP monitoring requirements include: one year of stream temperature from two locations in Little Seneca Creek (upstream and downstream of the future SWM / sediment control facility outfall) and one year of groundwater well readings from two wells. Construction began on the site in October of 2001.

DEP has received stream temperature data from both the upstream and downstream monitoring points for the period of 6/1/01 – 10/1/01. The data is consistent with other areas of the Little Seneca Creek mainstem and will be used as a baseline against which construction and post-construction monitoring results will be compared.

Two groundwater wells were installed in April of 2001. Bedrock was encountered during the installation of one well (MW-2) which has been dry during each reading since. Water elevation data is plotted in figure 7 for well MW-1. The one year pre-development monitoring requirement was not met for groundwater monitoring and will make it difficult to draw conclusions on BMP effectiveness in maintaining pre-development groundwater levels.



	4/19/2001	5/7/2001	6/11/2001	7/24/2001	8/19/2001	9/19/2001	10/19/2001	11/20/2001
MW-1	492.7	492.6	492.5	491.6	491.5	491.5	491.4	491.2
MW-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 7. Groundwater Well Data From Timbercreek.

All Souls Cemetery (pre-construction)

The site consists of 166 acres located at the northeastern corner of Brink Road and MD Route 27 (Ridge Road). The property is zoned RDT and the proposed development will include a cemetery, chapel and mausoleum complex. The majority of the property is located within the Wildcat Branch tributary of Great Seneca Creek.

Quantity control of storm water runoff is provided via a dry pond. This structure will provide both twelve-hour extended detention of the one-year storm and detention of the two-year storm. Quality control will be provided via a treatment train that consists of infiltration structures (if feasible) or bioretention structures, coupled with vegetated swales along roadways. Finally, the runoff will be conveyed, via a storm drain system, to a surface sand filter before outfalling to the dry pond. Quality structures are sized to treat a total of one-inch over the impervious area.

BMP monitoring on the site includes one continuous temperature logger and two channel cross-section study points in the small tributary that receives water from the detention pond. Pre-construction monitoring began in May of 2001. Construction on the site began during the fall of 2001. Some results of baseline temperature monitoring are presented in table 10 and figure 8 below. The data shows that the stream was below 68 degrees Fahrenheit most the summer of 2001. These results will be compared to subsequent results to assess the impacts of development.

Table 10. 2001 Wildcat Branch Tributary Stream Temperatures Below All Souls Cemetery

Month	Maxumum Temperature (F)	Median Temperature (F)	Number of Days State Use Class Criteria was Exceeded	Percent of Time State Use Class Criteria was Exceeded
June	68.7	62.3	2	0.69
July	71.0	63.7	4	6.18
August	74.1	67.5	21	39.74
September	68.4	61.7	1	0.63

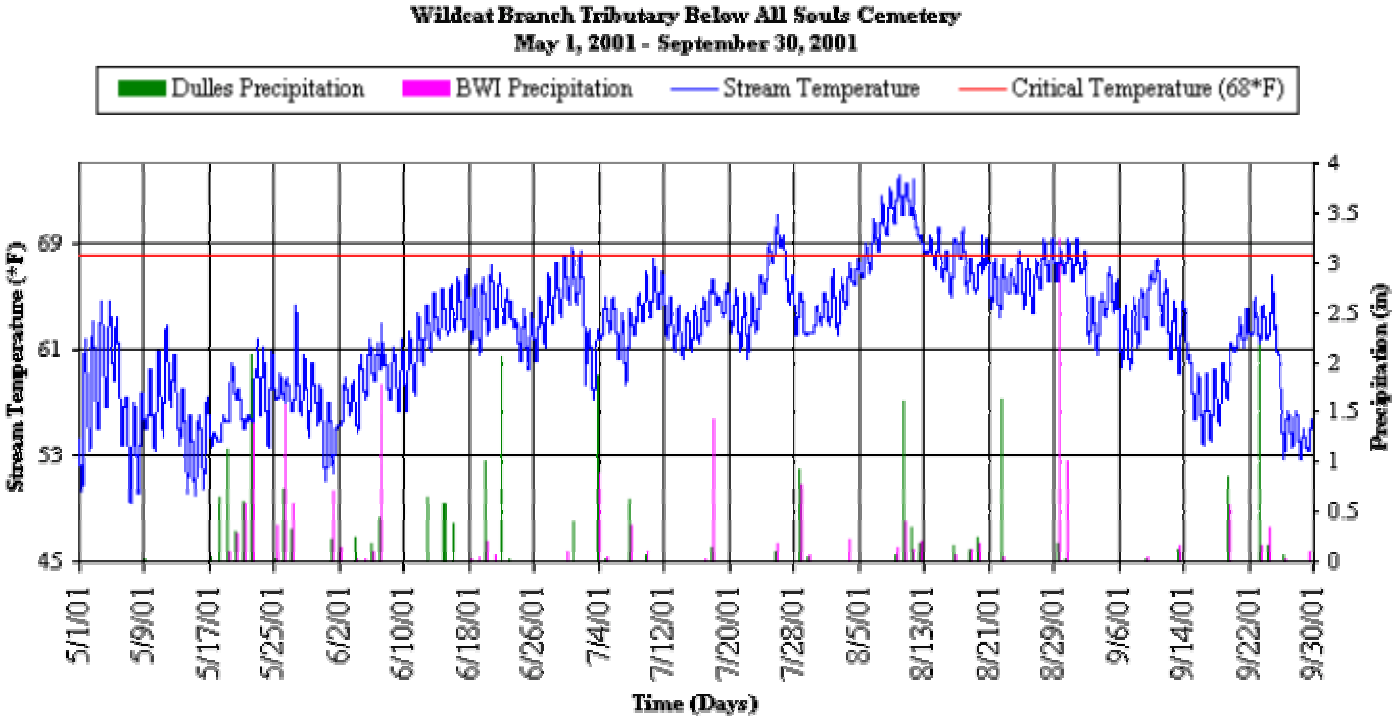


Figure 8. Water Temperature Data From Wildcat Branch – Downstream of All Souls Cemetary

4.1.4 Summary of Stream Monitoring in the Clarksburg SPA

Stream monitoring in Clarksburg SPA began in 1994 and is done on an annual basis at most stations throughout the SPA (see map - figure 2). During 2001, monitoring was completed at ten (10) baseline stations and six (6) development related stations. Results indicate little change in the biological community from previous years. Of the three SPA's, Clarksburg streams have exhibited the least temporal variability over the period of study (1994 – 2001). Stability in the biological community is a reflection of how little has changed with regard to land-use in Clarksburg. However, the beginning construction phases of the new Clarksburg Town Center began in August of 1999 and mark the beginning of big changes throughout the SPA. To date several single family and town homes have been completed in phase I of the Town Center and residents are beginning to move in.

4.1.4.a Biological Monitoring Results

Results of all biological monitoring completed thus far in the Clarksburg SPA are presented in Figures 9 and 10. Sixteen stations were sampled for benthic macroinvertebrates in 2001. Twelve stations were sampled in the Little Seneca Creek watershed. Three stations were sampled in the Ten Mile Creek watershed and one station was sampled in Wildcat Branch. Fish monitoring in 2001 was completed at nine stations in Little Seneca Creek and two stations in Ten Mile Creek. Last year DEP reported on a decline in the fish community during 2000 that was attributed to the drought of 1999. Monitoring results from 2001 indicate that the fish community has recovered to pre-1999 condition at all stations except LSLS103C located in the upper reaches of Town Center tributary.

DEP has observed some impact on the stream habitat from deposition of fine sediment in the Town Center tributary. Field observations made during 2001 noted an increase of fine sediments coating the stream bottom. Further investigation revealed the source of fine sediments to be in-stream channel stabilization work being done on the Town Center property as part of the Clarksburg Town Center water quality plan. It was determined that sediment was not coming from the construction site. Increased fine sediment does not appear to be a primary cause of low IBI score at station LSLS103C. Further downstream on the Town Center tributary at station LSLS103b the fish community has fully recovered to pre-1999 condition, unaffected by increased fine sediment. Low IBI score at LSLS103C is more a function of re-colonization rates of various fish species.

Certain fish species are slower to re-colonize after stressful conditions have caused many individuals to either die or vacate an area. For example, both sculpin species (Blueridge sculpin and Potomac sculpin) found in the Clarksburg SPA are relatively sedentary and do not migrate up and down a stream as other species do. For this reason re-colonization of sculpins, particularly in headwater areas of a stream, is dependent largely on propagation of those individuals who survived. At station LSLS103C the number of sculpins had dropped from 162 in 1998 to 10 in 2000 due to the drought of 1999. The number of sculpins found in 2001 is up to

22. Recovery of sculpins is occurring at a slower rate than for other more pollution tolerant species such as Blacknose dace. A lower IBI score at station LSLS103C for 2001 primarily reflects the low proportion of sculpins, in terms of the overall fish community and the high proportion of tolerant species such as Blacknose dace. In 2000 all species numbers were down so sculpins were more equally represented and IBI score was less affected.

Fish monitoring in Ten Mile Creek was completed at two stations (LSTM206 and LSTM303B) during 2001. Results from these stations show recovery of sculpins to pre-drought (1999) abundance. Overall, the number of individuals for all species was higher in 2001, however higher IBI scores are largely due to increased proportion of riffle/benthic fish species (e.g. Blueridge sculpin and Fantail darter). The number of sculpins never dropped off as much at station LSTM206 (39 individuals collected in 2000) as they did at LSTM303B (7 individuals collected in 2000). The difference is due to the fact that some flow was maintained in the stream at LSTM206 while at LSTM303B the stream was completely dry during the summer of 1999. This is interesting because LSTM206 has a watershed area of 388 acres while LSTM303B has 2,245 acres draining to it. Ten Mile Creek loses water during extremely dry periods as it flows from headwater areas downstream to Little Seneca Creek Lake, an important fact to bear in mind as development proceeds in the watershed. Added impervious surface reduces the quantity of water getting into the ground and consequently reduces baseflow in the stream resulting in more frequent periods when the mainstem of Ten Mile Creek goes dry. This illustrates how critical it will be to design development sites such that infiltration is a prominent feature of the Final Water Quality Plan. When 2000 building permits have been issued for the Clarksburg SPA, about two to five years from now, a decision will be made on whether to increase sewer capacity to the Ten Mile Creek side of the SPA and increase master plan density there. The ability of Clarksburg SPA developments to maintain existing groundwater levels should be factor in this decision.

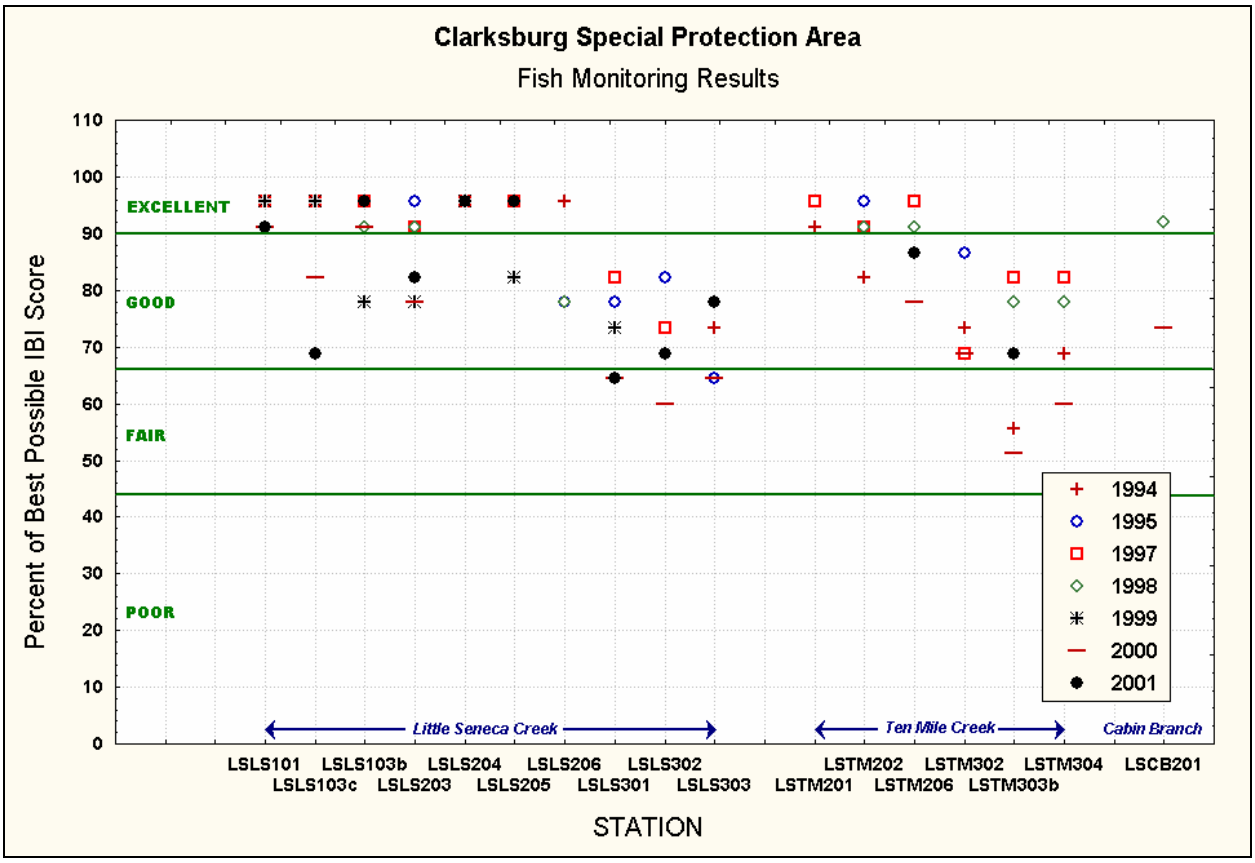


Figure 9. Results of Fish Monitoring in Clarksburg SPA

Biological monitoring results from stations around the new county Detention Center (LSTM206 and LSTM106) in Ten Mile Creek, indicate a decline in the benthic macroinvertebrate community at station LSTM206. Only a small piece of the Detention Center property drains to this monitoring station. Most of the property drains to monitoring station LSTM106 where no decline was detected in 2001. Although BMP monitoring results are not available for this report, stream monitoring results indicate no degradation of the stream ecosystem from construction of the Detention Center.

IBI scores at station LSTM206 have consistently been lower then the rest of Ten Mile Creek. There are several potential causes including; 1) run-off from I-270, 2) failing septic system(s) in Clarksburg, 3) industrial sources along Rt. 355, 4) run-off from a portion of Gateway 270 Industrial Park.

Results of benthic macroinvertebrate monitoring from the rest of Clarksburg SPA indicate condition at most stations is within the range of natural variability exhibited in previous years. The exceptions are LSLS205 and LSLS206. Greatest decline occurred at LSLS206. The probable cause is the recent installation of a sewer crossing, which caused significant disturbance to the stream channel. Follow-up monitoring will be done here in 2002.

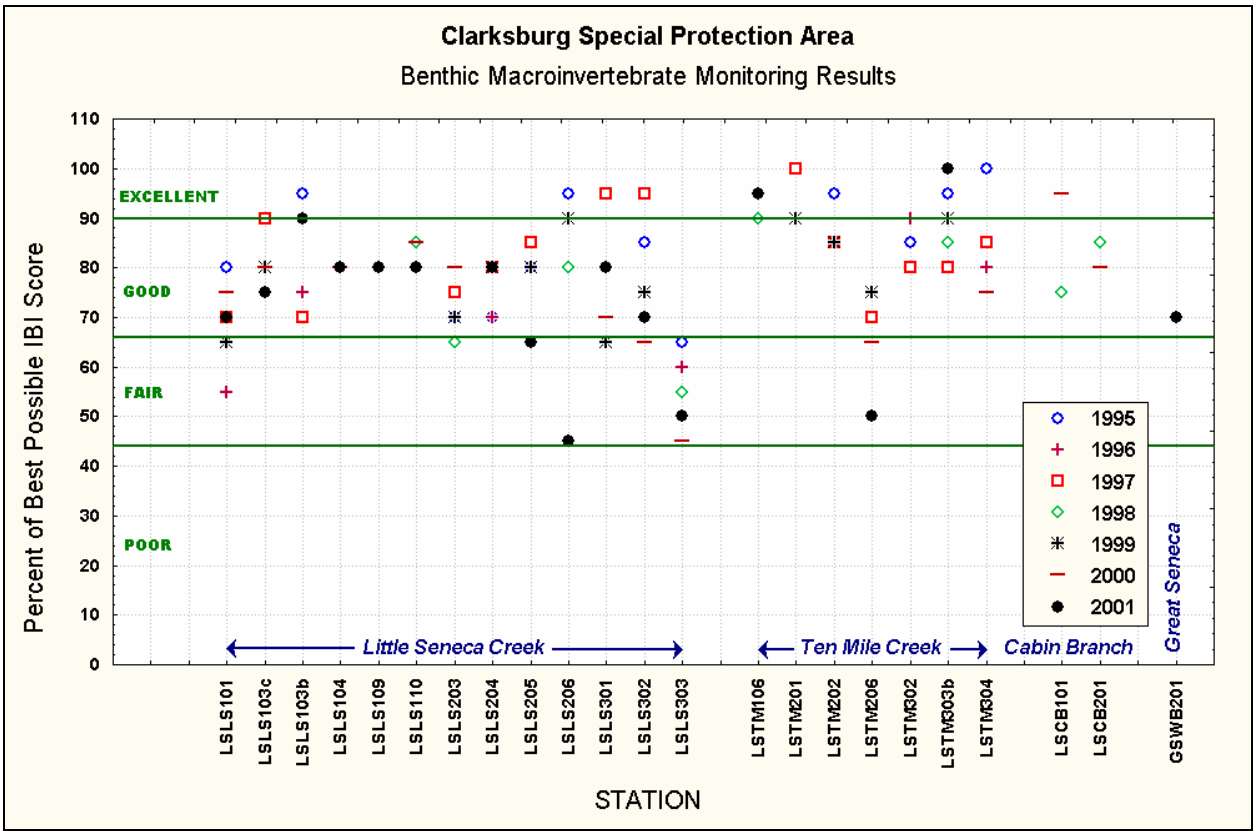


Figure 10. Results Benthic Macroinvertebrate Monitoring in Clarksburg SPA

Results of benthic macroinvertebrate monitoring at both stations in the Town Center tributary show condition remaining in the good range. This supports the notion that fine sediments have not yet impacted the ecosystem in this tributary.

4.1.4.b Habitat Monitoring

Rapid Habitat Assessment

Rapid habitat assessments completed along with biological monitoring are visual based assessments where stream habitat is broken out into10 parameters. The scores for each parameter are summed and the total score is used to assign a narrative habitat condition of optimal, sub-optimal, marginal, or poor. Rapid habitat assessments are helpful in determining if stream habitat conditions are the cause of impairment to the biological community.

Results of all rapid habitat assessments completed from 1994 to 2001 are presented in figure 11. All monitoring stations have remained in the optimal/suboptimal range. Exceptions are stations LSLS205, LSLS206, LSLS302 where quality of stream habitat is impaired by a lack of riparian vegetation, i.e. forested flood plain.

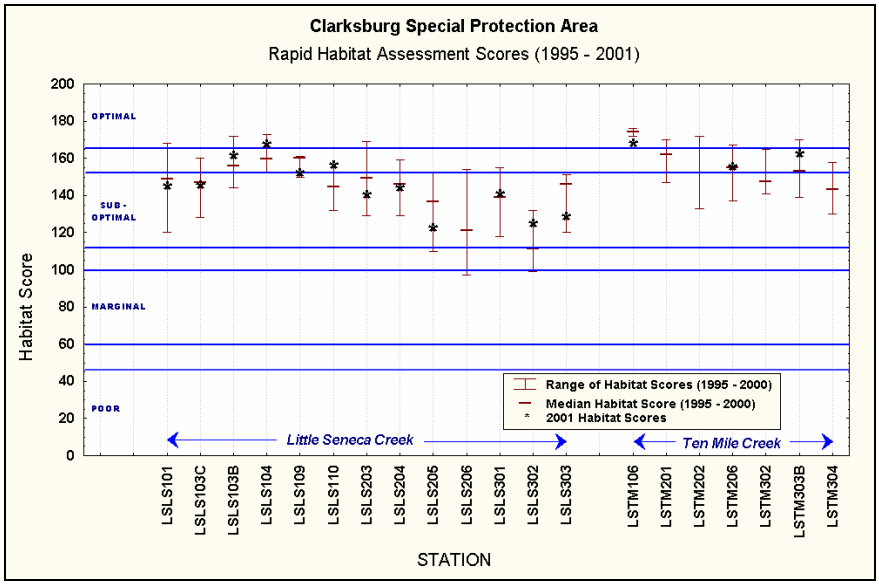


Figure 11. Rapid Habitat Scores from Clarksburg SPA

DEP explored options for forestation of the flood plain in the vicinity of West Old Baltimore Rd. through use of various assistance programs offered by State and Federal agencies. However, the property has submitted plans for development and therefore forestation of the flood plain will be required on approved site plans as per County's Environmental Guidelines. In addition, the State Highway Administration and the private developer are proceeding with plans to make the floodplain wetland mitigation sites. If these plans continue to proceed, M-NCPPC will require the creation of forested wetlands to achieve the goals of the Environmental Guidelines.

Rapid habitat assessments conducted along Ten Mile Creek did not reveal any new problems in 2001. Stream habitat remains in the optimal/sub-optimal range.

Stream Channel Morphology Monitoring

A stream channel survey was completed at one station (LSLS103C) during 2001. Located within the Town Center tributary (just downstream of Stringtown Road) this station has experienced a little change in cross sectional area (Figure 12) between the years of 1997 and 2001. The stream channel widened and increased in cross-sectional area by 0.7 square feet.

With construction of Clarksburg Town Center now under way (as of 8/99) it will be particularly interesting to see how the stream channel at LSLS103C responds to this disturbance over the next few years.

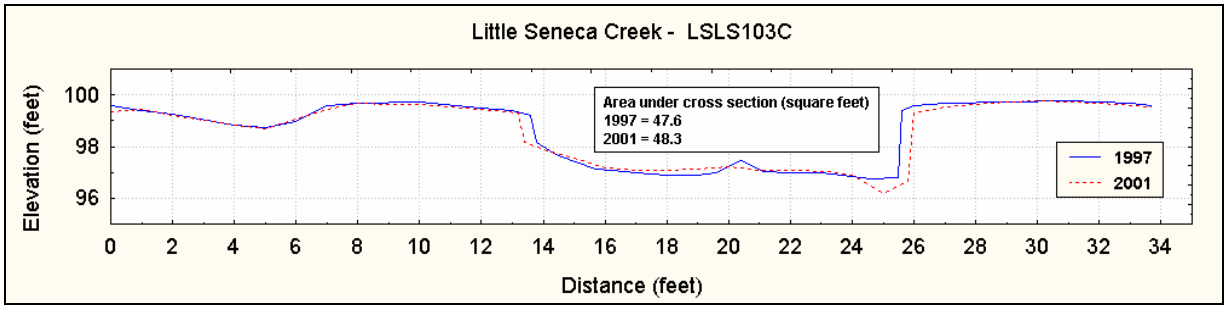


Figure 12. Cross Section of Stream Channel at Station LSLS103C

4.1.4.c Stream Temperature Monitoring

Clarksburg Town Center Tributary

A Continuously recording temperature logger was deployed at LSLS103C during the summer of 2001. Results from 2001 along with all three previous years at LSLS103C are presented in table 11. Water temperature data from 1997 and 1998 were collected before construction activity began at the Town Center and will be used as baseline stream water temperature at this site. The first sediment control pond was constructed on the Town Center property in August of 1999. Data collected during 2000 and 2001 are from the during-construction period. There does appear to be some thermal impact from the new sediment control ponds, particularly with maximum stream water temperatures. Maximum stream temperatures recorded during each year all correlate with storm events. Maximum temperature spikes are greater for the during-construction years of 2000 and 2001. Flushing of sediment ponds during large storms sending a pulse of warm water downstream is the probable cause. Sediment ponds are designed to have a permanent pool of water that is exposed to solar radiation resulting in very warm temperatures. Large storms can flush out the warm water resulting in brief pulses of warm water downstream. Although this temperature increase is undesirable, it is preferable to the release of large amounts of sediment from a site.

Table 11. Summary of Continuous Water Temperature Data From Station LSLS103C
(study period for each year is June 1 – Sept. 30)

Year	Number of Observations	Maximum (Fahrenheit)	Mean (Fahrenheit)	Standard Deviation	Percent of Time 75^0 F Criteria Was Exceeded	Mean Air Temp. (F) *
1997	7320	71.7	61.7	3.69	0 %	72.9
1998	3196	71.7	64.1	3.36	0 %	74.0
2000	7320	74.1	64.9	3.88	0 %	70.6
2001	7320	73.1	63.1	3.96	0 %	72.3

* Air temperature data from Damascus, MD

Although there has been an increase in maximum temperature, the 75^0F criteria for Use IV-P streams was not exceeded during 2000 and 2001.

Cabin Branch Monitoring Results

Biological monitoring in Cabin Branch was completed in 1998 and 2000. Fish monitoring is done at one Cabin Branch station (LSCB201), located downstream of West Old Baltimore Road. Drainage area for the other station (LSCB101) is too small for fish monitoring. Benthic macroinvertebrate monitoring is done at both stations.

Results show condition of the benthic macroinvertebrate community is in the good/excellent range at both stations (figure 10). Fish monitoring results from LSCB201 also indicate good/excellent condition (figure 9).

Data from a temperature logger placed in Cabin Branch at LSCB201 during the summer of 1998 show water temperatures generally remaining below the State Use Class III criteria of 68^0 F (figure 13).

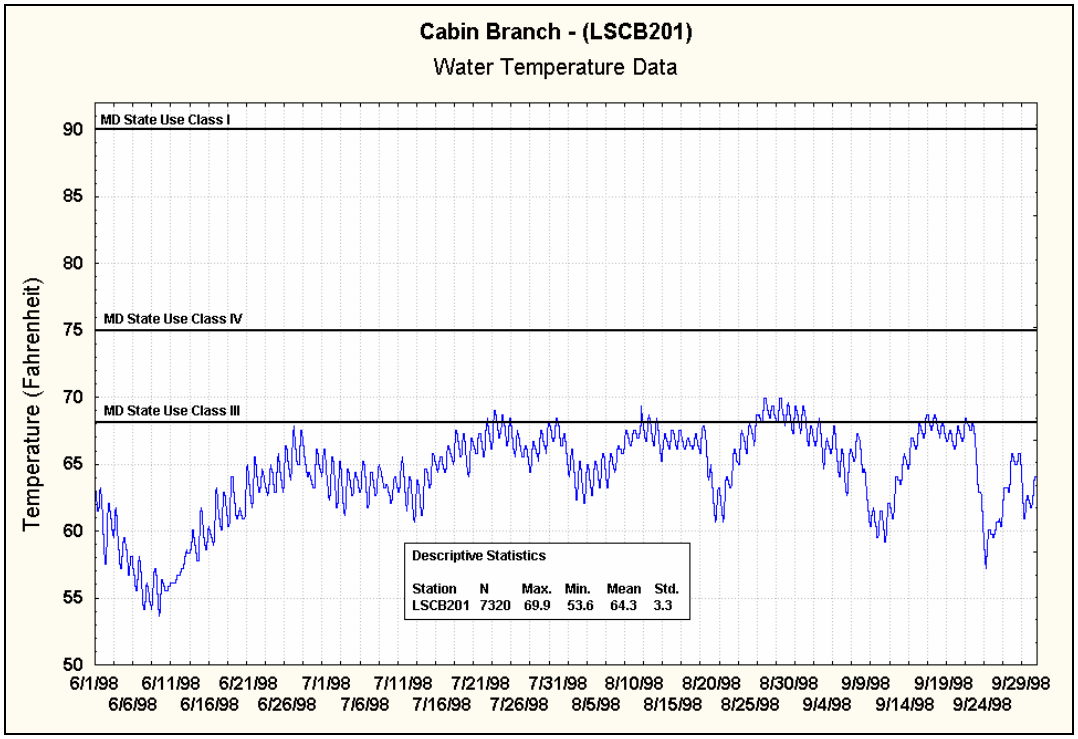


Figure 13. Temperature Data from Cabin Branch (LSCB201)

Cabin Branch is currently designated by Maryland as Use Class I which means that discharges to the stream must not result in ambient stream temperature to exceed 90^0 F. Temperature data

show Cabin Branch currently meets Use III standards. To maintain biological integrity stream temperatures should not increase.